Original Article

Hemodialysis, Plea of Availability versus Adequecy Gezira Experience

Mohamed Elhafiz[1], Mohamed El Imam [2], Omran O [2], Alwaleed A/Gabar [3], Elhadi Miskeen [4]

ABSTRACT

Objectives: This is a prospective cross sectional study carried out in Gezira Hospital for Renal Diseases and Surgery (Sudan) to assess the adequacy of hemodialysis in 206 patients with end stage kidney disease on regular hemodialysis twice per week using.

Methods: Pre and post hemodialysis blood sample were obtained from the study group, spKt/V and urea reduction ratio were calculated.

Results: Mean Kt/v was found to be 1.19 and urea reduction ratio was 59.55%.

None of the patients in this study group achieved the National Kidney Foundation Dialysis Outcomes Quality Initiative (K/DOQI) recommendations for adequate hemodialyis, since it requires three hemodialyis sessions per week and our patients are receiving two sessions per week.

Conclusion: In order to improve the situation herewith we recommended increased number of sessions from two to three times per week and \or increase the duration of hemodialysis session, increase blood flow rate and dialysate flow rate. Moreover, decrease the number of patients on regular hemodialysis by encouraging the patients to take the other renal replacement therapy (peritoneal dialysis and renal transplantations).

Key words: Gezira, dialysis, ESRD

Chronic kidney disease (CKD) is a worldwide public health problem; there is a rising incidence and prevalence of kidney failure[1].

A central issue in the management of patients undergoing maintenance hemodialysis is the assessment of adequacy of dialysis. The two commonly accepted measures of hemodialysis dose are based on the fractional reduction of blood urea nitrogen concentration during a single hemodialysis treatment[2,3]. The most frequently used measure of hemodialysis dose is the urea reduction ratio (URR), calculated by dividing the decrease in blood urea nitrogen (pre dialysis minus post dialysis blood urea nitrogen) by the pre dialysis concentration, expressed as a percentage[2-5].

Another measure of hemodialysis dose is based on the pharmacokinetic theory that the fractional decrease in urea during a dialysis treatment is a mathematical function of the *artificial* kidney's clearance of urea (K) times the length of the treatment (t), divided by the urea distribution volume (V), approximated by the total body water (TBW)[6,7]. This ratio, Kt/V,2-5 can be calculated from the URR and they are conceptually and mathematically similar[5-7]. Patient mortality is higher when the amount of urea removed (hemodialysis "dose") is low, and vice versa.

Optimum dialysis is defined as that dose of dialysis above which no further improvement in the morbidity and mortality associated with dialysis can be expected[8].

A number of factors contribute to Kt/V including the size of the dialysis membrane, the blood flow rate to the dialyzer (Qb), the dialysate flow rate (Qd), the most important

1.Consultant nephrologist, Gezira Hospital for Renal Disease &Surgery , Sudan
2.Urologist, department of surgery, University of Gezira, Sudan
3.Assistant Professor of Medicine, University of Gezira, Sudan
4.Educational Development & Research Centre (Registrar Obs Gyn, University of Gezira)
Correspondence: mohammedimam@hotmail.com

determinant affecting the dose of dialysis is the duration and the volume of distribution of urea.

National Kidney Foundation Dialysis Outcomes Quality Initiative (K/DOQI) recommendations for adequate hemodialysis are a urea reduction ratio of 70% and single pool Kt/v (spKt/v) with a desired value of 1.3 or greater[9].

Gezira Hospital for Renal Diseases and Surgery (Sudan) is the one of the well-established hemodialyis center in Sudan with large catchment's area, where 258 patients are in regular hemodialysis. We carried out this study to assess the adequacy of hemodialysis in our patients by calculating urea reduction ratio (URR) and spKt/v

PATIENTS AND METHODS

This is cross sectional study conducted in Gezira Hospital for Renal Diseases and Surgery Wad Madani Sudan from November 2008 to December 2008. It worth noting that, this is the only fully specialized hospital, dealing solely with urology and nephrology and it therefore shoulders the largest serve from various catchments' areas. Two hundred and six patients under regular hemodialysis treatment twice per week; four hours per session were included in this study.

Because of the escalating numbers of patients doomed for this type of renal replacement therapy and non-equivalent surge in the transplant to co apt with these patient most of the centers in this area are adopting two sessions method. Not only this but also in a precarious jeopardy it may be reduced to even one session in an episode of an emergent time. Nevertheless, all our patients are receiving regular two sessions despite the overwhelming emergencies and back flow of patients from the capital.

Blood sample was obtained pre and post hemodialysis session. Post hemodialysis blood sample was taken after setting the ultra filtration (UF) rate to zero, blood pump to be set at 100 mL per minute for 20 seconds then the blood pump stopped and the samples were drawn Post dialysis. Body weight was estimated. Fluid ultra filtration was recorded. Blood urea was checked in both samples. Urea reduction ratio (URR) and spKt/v were calculated.

RESULTS

This study included 206 patients with end stage kidney disease on regular hemodialysis. About 142 (68.9%) were males. The study group age ranged from 15 to 80 years with mean ±standard deviation (SD) of 46.65±15.46 years.

The maximum pre-dialysis blood urea was found to be 255 mg/dl; the minimum pre dialysis urea was 55 mg/dl with mean±SD of 141.02±31.17 mg/dl. Post-dialysis blood urea was ranging from 18 to 183 with mean± SD of 58.36±24.12 mg/dl. The ultra filtration was ranging from zero to 5 liter with mean± SD of 2.125±1.12 liter. The patients' weight ranged from 20 kg to 98 kg with mean± SD of 55.16 ±14.11 kg.

We found that the mean of urea reduction ratio was 59.66%, the minimum URR 10% and the maximum was 86% (SD 11.86). The mean spKt/v was found to be 1.19, the minimum spKt/v was 0.32 and the spKt/v maximum was 2.50 (SD 0.41) figure (1).

DISCUSSION

Adequacy of hemodialysis is an important issue, since it appears to be an important determinant of patient survival[1]. Owen et al found that, low urea reduction ratios during dialysis are associated with increased odds ratios for death[10].

In our study we found that mean urea reduction ratio is 59.66% and we found that 164 (79.6%) patients were having URR below the recommended level by the National Kidney Foundation Dialysis Outcomes Quality Initiative (K/DOQI). K/DOQI recommendation for adequate hemodialysis spKt/v with a desired value of 1.3 or greater is three times a week[9]; only 68 (33.01%) patients achieved this target with two times a week.

National Cooperative Dialysis Study (NCDS) found that a Kt/V urea above 0.9 with thrice-weekly treatment provided an "adequate" dialysis prescription in that the patient failure rate of 13 percent was substantially below that in patients with a lower Kt/V[11-13].

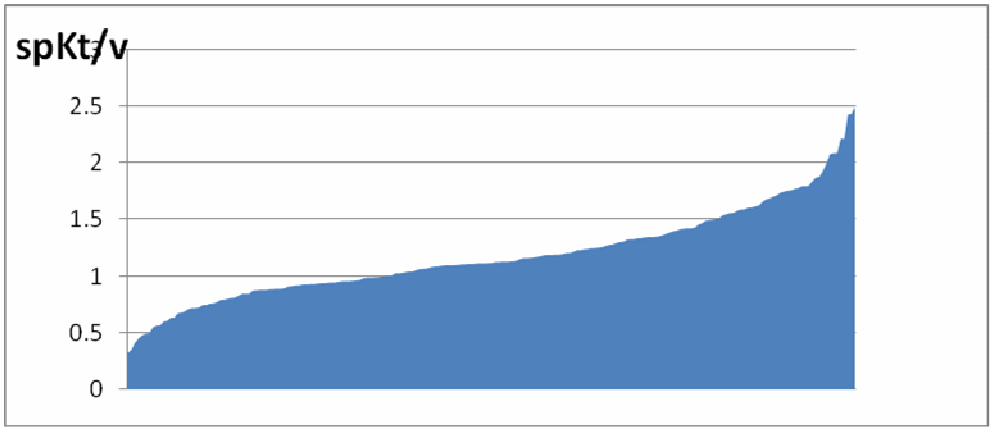

Figure (1): Single pool Kt/v finding in the study group

In the year 2005 annual report, the mean delivered sp Kt/V of adult in-center dialysis patients in the United States[14] was 1.55. By comparison, a 2004 survey of dialysis practices in the years 1998 to 2000 in five European countries[15] found that the mean delivered spKt/v varied from 1.28 to 1.50, while we found the mean delivered spKt/v was 1.19.

Cher tow et al observed that there is an increased relative risk of death among patients with extremely high values for spKt/v (greater than 1.6) or the URR between 75 and 79 percent[16,17]. Support for the hypothesis that the increased death rate may be due to the effects of marked malnutrition comes from a study which evaluated the correlation between mortality, dialysis dose, and body volume in over 3000 dialysis patients[18]; thirty one (15%) of our patient were having spKt/v above 1.6.

In an attempt to address the question of optimal dialysis dose, a large clinical trial, called the Hemodialysis (HEMO) Study was performed. In HEMO study, in which patients were randomized to receive spKt/v levels of about 1.3 versus 1.7, patients assigned to the higher dose of dialysis did not live longer, were not hospitalized less frequently, and were not found to manifest nutritional or other benefits[19].

Gotch has proposed that a Kt/V of about 1.8-2.0 delivered twice weekly is roughly equivalent to a spKt/V of 1.0 delivered three times per week[20]. Our whole study group is having two session of hemodialysis per week, only 13 (6.31%) achieved spKt/v of 1.8 or above.

CONCLUSION

None of the patients in this study group achieved the K/DOQI recommendations for adequate hemodialysis, since it requires three hemodialysis sessions per week and our patients are receiving two sessions per week. To improve the condition we need to increase number of sessions from two to three times per week and \or increase the duration of hemodialysis session, increase blood flow rate and dialysate flow rate. Moreover, decrease the number of patients on regular hemodialysis by encouraging the patients to take the other renal replacement therapy.

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